When, why and how to test spreadsheets

Louise Pryor

XLSior

Outline

- What is testing?
- Unit testing
- System testing
- Regression testing
- Problems

What is testing?

Reviewing	Testing
- Inspect	- Run the code
- Manual or automatic	- Manual or automatic
- Automated: syntactic	- Automated: semantic
- Depth depends on the reviewer's understanding	- Breadth depends on the execution paths chosen

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When to test

- Unit testing individual components
- System testing as a whole
- Regression testing new against old
- Acceptance testing by user

- All are more difficult with spreadsheets

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Unit testing

- Making sure that individual calculations are correct
- Can be used to check for unanticipated side effects of changes
  - But only if performed often, which means automatically

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Testing for invariants

- Run every time the spreadsheet is recalculated
- Examples
  - Cross check row and column totals
  - Percentages sum to 100%
  - Specific values always positive, negative, or within a specified range
  - …
- Can summarise the results, so all checked at once

Using data tables

- Look at what happens when one or two values are changed
- When they are run depends on calculation settings
- Can be used to isolate a single calculation step
- In Excel, input value must be on same sheet
- May adversely affect calculation times

Macros

- Can be used for large sets of test data
- Substitute in appropriate values, recalculate and record results
- Easy to use for column-by-column calculations
- Run semi-automatically, include timestamp in results

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XLSior

- Provides auditable record of the testing that has been performed
- Also includes automatic documentation, version control, auditable imports, and more...

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Devising unit tests

- Think about what can go wrong
- Test boundary values as well as typical values
- Try to isolate individual calculations
- Test lookups, alignments of SumProducts, etc
- Exercise all branches of conditionals

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- System and regression testing
- Problems

System testing

- Test a range of scenarios
  - Typical inputs
  - Unusual combinations
- Need independent calculation of expected results
  - Not easy to come by

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Regression testing

- A special kind of system testing
- Check that results have not been altered
  - Or investigate the effects of changes
- Doesn't test correctness directly
- Only feasible when
  - Layout of outputs hasn't changed
  - Or only a few outputs need to be tested
- Use a range of scenarios

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How to regression test

- Custom macros in a third workbook
  - 4 sheets for each scenario: input values, 2 results and comparison
- Compare absolute values or tolerance
- XLSior can be used for importing, recording the source and time

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Problems

- It's always more difficult with spreadsheets than more conventional programming languages
- Lack of specification
- Devising tests
  - Especially with large complex formulae
  - Lack of modularity in spreadsheets

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Advantages

- More confidence in the reliability of results
- Regular and systematic unit testing encourages modular design of spreadsheets
- Forcing function for specifications

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